

1. A tilt-angle implant method of forming an LDD (Lightly Doped Drain) in a high voltage device comprising the steps of:

providing a silicon substrate having a plurality of active and field regions defined;

forming a thick gate oxide layer over said substrate;

forming a gate electrode over said thick gate oxide layer;

performing a first ion implantation with a tilt-angle;

forming oxide spacers on sidewalls of said gate electrode; and

performing a second ion implantation with no tilt-angle.

2. The method of claim 1, wherein said forming said thick gate oxide layer is accomplished by chemical vapor deposition at a temperature between about 450 to 600°C.

3. The method of claim 1, wherein said gate oxide layer has a thickness between about 3000 to 5000 angstroms (Å).

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4. The method of claim 1, wherein said forming said gate electrode is accomplished by depositing a polysilicon layer at a temperature between about 570 to 625°C, and patterning said polysilicon layer.

5. The method of claim 4, wherein said patterning said polysilicon layer is accomplished with an etch recipe having gases Cl_2 and HBr .

6. The method of claim 4, wherein said polysilicon layer has a thickness between about 1000 to 2000 Å.

7. The method of claim 1, wherein said performing said first ion implantation for an NMOS device is accomplished with phosphorous ions at a dosage level between about 1×10^{13} to 5×10^{13} atoms/cm², and at energy level between about 35 to 55 KeV.

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8. The method of claim 1, wherein said tilt-angle is between about 40 to 45 degrees.

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9. The method of claim 1, wherein said performing said first ion implantation for a PMOS device is accomplished with boron ions at a dosage level between about 1×10^{13} to

5×10^{13} atoms/cm², and at energy level between about 20 to 35 KeV.

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10. The method of claim 1, wherein said performing said first ion implantation is accomplished by rotating said substrate at a tilt-angle between about 40 to 45°.

11. The method of claim 1, wherein said forming said oxide spacers on sidewalls of said gate electrode is accomplished by depositing an oxide layer to a thickness between about 1200 to 1500 Å, and then anisotropically etching said oxide layer.

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12. The method of claim 1, wherein said performing said drain ion implantation is accomplished with As ions at a dosage level between about 2×10^{15} to 5×10^{15} atoms/cm², and at energy level between about 40 to 60 KeV.

13. An optimum implant angle method of forming a DDD (Doubly Doped Drain) in a stacked flash memory cell comprising the steps of:

providing a silicon substrate having a plurality of active and field regions defined;

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forming a gate oxide layer over said substrate;

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forming a floating gate over said thick gate oxide layer;

12 forming an inter-gate oxide layer over said floating gate;

forming a stacked control gate over said inter-gate oxide;

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forming oxide spacers on sidewalls of said stacked gate;

18 performing a first lightly doped implantation with an optimum tilt-angle; and

21 performing a second heavily doped implantation with an optimum tilt-angle.

24 14. The method of claim 13, wherein said gate oxide layer has a thickness between about 80 to 95 Å.

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15. The method of claim 13, wherein said forming said floating gate is accomplished by depositing a first polysilicon layer to a thickness between about 1000 to 2000 Å, and then etching said first polysilicon layer.

18 performing a drive-in diffusion of said doubly doped drain,
DDD.

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24. The method of claim 23, wherein said plurality of gates
are floating gate and control gate of said flash memory
3 cell.

25. The method of claim 23, wherein said optimum angle is
between about 40 to 50 °.

26. The method of claim 23, wherein said performing said
first lightly doped implantation is accomplished with
3 phosphorous ions at a dosage level between about 1×10^{13} to
 5×10^{13} atoms/cm², and at energy level between about 35 to 55
KeV.

27. The method of claim 23, wherein said performing said
second heavily doped implantation is accomplished with
3 arsenic ions at a dosage level between about 2×10^{15} to 5×10^{15}
atoms/cm² at energy level between about 40 to 60 KeV.

28. The method of claim 23, wherein said performing said drive-in diffusion of said DDD is accomplished at a temperature between about 850 to 950°C.

29. A stacked gate having a doubly diffused drain (DDD) comprising:

a junction having a lightly doped profile; and

a surface region having a heavily doped profile.

30. A stacked gate of claim 29, wherein said lightly doped profile comprises phosphorous ions at a dosage level between about 1×10^{13} to 5×10^{13} atoms/cm².

31. A stacked gate of claim 29, wherein said heavily doped profile comprises arsenic ions at a dosage level between about 1×10^{15} to 5×10^{15} atoms/cm².